

**Project Special Provisions  
Culvert**

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A circular professional seal for Roy M. Carolami, a Professional Engineer in North Carolina. The seal contains the text "NORTH CAROLINA PROFESSIONAL SEAL 9804 ROY ENGINEER M. CAROLAMI". Below the seal is a handwritten signature "Roy M. Carolami" and the date "11-24-04".

**PROJECT SPECIAL PROVISIONS**  
**CULVERT**

PROJECT B-3424

CABARRUS COUNTY

**ADHESIVELY ANCHORED ANCHOR BOLTS OR DOWELS**

(10-12-01)

**1.0 DESCRIPTION**

The work covered by this Special Provision consists of furnishing all necessary labor, equipment, and materials and performing all operations necessary for installing anchor bolts/dowels in concrete using an adhesive bonding system in accordance with the details shown on the plans and with the requirements of this specification unless otherwise directed.

Submit a description of the proposed adhesive bonding system to the Engineer for review, comments and acceptance. Include in the description the bolt type and its deformations, equipment, manufacturer's recommended hole diameter, embedment depth, material specifications, and any other material, equipment or procedure not covered by the plans or these specifications. List the properties of the adhesive, including density, minimum and maximum temperature application, setting time, shelf life, pot life, shear strength and compressive strength. If bars/dowels containing a corrosion protective coating are required, provide an adhesive that does not contain any chemical elements that are detrimental to the coating and include a statement to this effect in the submittal.

**2.0 MATERIALS**

Use an adhesive bonding system that has been tested for a tensile strength of 125% of the specified anchor bolt/dowel yield load. Provide certification that, for the particular bolt grade, diameter and embedment depth required, the anchor system will not fail by adhesive failure and that the anchor bolt/dowel will not move. The minimum concrete compressive strength is 3000 psi (20.7 MPa) for certification and anchorage selection.

Package components of the adhesive so that one whole container of each component mixes to form one batch of adhesive. Use containers designed so that all of the contents may be removed easily and sealed tightly to prevent leakage. Furnish adhesive material requiring hand mixing in two separate containers designated as Component A and Component B. Provide a self contained cartridge or capsule consisting of two components which are automatically mixed as they are dispensed, as in the case of a cartridge, or drilled into, as in the case of a capsule.

Clearly label each container with the manufacturer's name, date of manufacture, batch number, batch expiration date, direction for use, and warnings and precautions concerning the contents as required by State or Federal Laws and Regulations.

### 3.0 PROCEDURE

#### A. Drilling of Holes into Concrete

When directed, use a jig or fixture to ensure the holes are positioned and aligned correctly during the drilling process. Upon approval, adjusting hole locations to avoid reinforcing steel is permitted.

Drill the holes with a pneumatic drill unless another drilling method is approved. Follow the manufacturer's recommendations regarding the diameter of the drilled hole.

Immediately after completion of drilling, blow all dust and debris out of the holes with oil-free compressed air using a wand extending to the bottom of the hole. Remove all dust from the sides of the holes by brushing the holes with a stiff-bristled brush of a sufficient size and then blow the hole free of dust. Repeat this procedure until the hole is completely clean. Check each hole with a depth gauge to ensure proper embedment depth.

Repair spalled or otherwise damaged concrete using approved methods.

#### B. Inspection of Holes

Inspect each hole immediately prior to placing the adhesive and the anchor bolts/dowels. Ensure all holes are dry and free of dust, dirt, oil, and grease. Rework any hole that does not meet the requirements of this Special Provision.

#### C. Mixing of Adhesive

Mix the adhesive in strict conformance with the manufacturer's instructions.

#### D. Embedment of Anchor Bolt/Dowel

Clean each anchor bolt/dowel so that it is free of all rust, grease, oil, and other contaminants.

Unless otherwise shown on the plans, the minimum anchor bolt/dowel embedment depth is such that the adhesive develops at least 125% of the anchor bolt/dowel yield load as determined by the manufacturer.

Insert the anchor bolt/dowel the specified depth into the hole and slightly agitate it to ensure wetting and complete encapsulation. After insertion of the anchor bolt/dowel, strike off any excessive adhesive flush with the concrete face. Should the adhesive fail to fill the hole, add additional adhesive to the hole to allow a flush strike-off.

Do not disturb the anchor bolts/dowels while adhesive is hardening.

#### 4.0 FIELD TESTING

When specified on the plans, test the installed anchor bolts/dowels for adequate adhesive as specified below. Inform the Engineer when the tests will be performed at least 2 days prior to testing. Conduct the tests in the presence of the Engineer.

Use a calibrated hydraulic centerhole jack system for testing. Place the jack on a plate washer that has a hole at least 1/8 inch (3 mm) larger than the hole drilled into the concrete. Position the plate washer on center to allow an unobstructed pull. Position the anchor bolts/dowels and the jack on the same axis. Have an approved testing agency calibrate the jack within 6 months prior to testing. Supply the Engineer with a certificate of calibration.

In the presence of the Engineer, field test 10% of the first 50 anchor bolts/dowels prior to installing any additional anchors. For testing, apply and hold briefly 90% of the anchor bolt/dowel yield load shown on the plans. No visible signs of movement of the anchor bolts/dowels is permitted under this load. Upon receiving satisfactory results from these tests, install the remaining anchors. Test a minimum of 2% of the remaining anchors as previously described.

Record data for each anchor bolt/dowel tested on the report form entitled "Installation Test Report of Adhesively Anchored Anchor Bolts or Dowels". Obtain this form from the North Carolina Department of Transportation Materials and Tests Engineer. Submit a copy of the completed report forms to the Engineer.

Final acceptance of the adhesively anchored system is based on the conformance of the pull test to the requirements of this specification. Failure to meet the criteria of this specification is grounds for rejection.

#### 5.0 BASIS OF PAYMENT

No separate measurement or payment will be made for furnishing, installing, and testing anchor bolts/dowels.

Payment at the contract unit prices for the various pay items will be full compensation for all materials, equipment, tools, labor, and incidentals necessary to complete the above work.

### **PRECAST REINFORCED CONCRETE** **BOX CULVERT AT STATION 13+14.00 -L-**

**(2-14-04)**

#### 1.0 GENERAL

This Special Provision covers precast reinforced concrete box culverts intended for the construction of culverts and for the conveyance of storm water.

Where a precast reinforced box culvert is required on the plans, design the precast culvert sections in accordance with AASHTO M259 and provide the size and number of barrels as

indicated on the plans. Precast wing walls will not be allowed. For culverts with less than 2 feet (0.6 m) of cover, design the precast culvert sections in accordance with AASHTO M273. Detail the culvert with cast in place wings. Provide a precast box culvert that meets the requirements of Section 1077 and any other applicable parts of the Standard Specifications.

The design of the precast members is the responsibility of the Contractor and is subject to review, comments and approval. Submit two sets of detailed plans for review. Include all details in the plans, including the size and spacing of the required reinforcement necessary to build the precast box culvert. Include checked design calculations for the precast members complying with the latest AASHTO Standard Specifications and requirements detailed herein. Have a North Carolina Registered Professional Engineer check and seal the plans and design calculations. After the plans are reviewed and, if necessary, the corrections made, submit one set of reproducible tracings on 22" x 34" sheets to become the revised contract plans.

A pre-installation meeting is required prior to installation. Representatives from the Contractor, the precast box manufacturer, and the Department should attend this meeting. The precast box manufacturer representative shall be on site during installation.

## **2.0 PRECAST REINFORCED CONCRETE BOX SECTIONS**

### **A. Types**

Precast reinforced concrete box sections manufactured in accordance with this Special Provision are designated by span, rise, and design earth cover.

### **B. Design**

1. Design – The box section dimensions and reinforcement details are subject to the provisions of Section F.
2. Placement of Reinforcement – Provide a 1 inch (25 mm) concrete cover over the circumferential reinforcement subject to the provisions of Section F. Extend the inside circumferential reinforcement into the male portion of the joint and the outside circumferential reinforcement into the female portion of the joint. Detail the clear distance of the end circumferential wires so it is not less than 1/2 inch (13 mm) nor more than 2 inches (51 mm) from the ends of the box section. Assemble reinforcement per the requirements of AASHTO M259, Section 7.3. The exposure of the ends of the wires used to position the reinforcement is not a cause for rejection.
3. Laps and Spacing – Use lap splices for the circumferential reinforcement. Detail the circumferential wires so that the center to center spacing is not less than 2 inches (50 mm) nor more than 4 inches (100 mm). Do not detail the longitudinal wires with a center to center spacing of more than 8 inches (200 mm).

4. The design earth cover is reported on the plans as the elevation difference between the point of maximum fill and the top of the top slab.

### C. Joints

1. Produce the precast reinforced concrete box section with male and female ends. Design and form these ends of the box section so, when the sections are laid together, they make a continuous line of box sections with a smooth interior free of appreciable irregularities in the flowline, all compatible with the permissible variations given in Section F. The internal joint formed at the male and female ends of the precast units shall be sealed with either bitumen/butyl sealant or closed-cell neoprene material. The internal joint material shall be installed in accordance with the manufacturer's recommendations. The material shall be shown on the shop drawings when they are submitted for review.
2. Seal the external joint with an outside sealer wrap that is at least 12 inches (300 mm) wide and covers the joint on both the sides and the top of the box section. Use ConWrap CS-212 from Concrete Sealants, Inc., EZ-Wrap from Press-Seal Gasket Corporation, Seal Wrap from Mar-Mac Manufacturing Co., Inc., Cadilloc External Pipe Joint from Cadilloc, or an approved equal for the outside sealer wrap. If the outside sealer wrap is not applied in a continuous strip along the entire joint, a 12 inch (300 mm) minimum lap of the outside sealer wrap is permitted. Before placing the outside sealer wrap, clean and prime the area receiving the outside sealer wrap in accordance with the sealer wrap manufacturer recommendations. The joint wrap manufacturer installation recommendations shall be included with shop drawings submitted for review. The external joint wrap shall be installed in three pieces, as indicated on Figure 1 below:

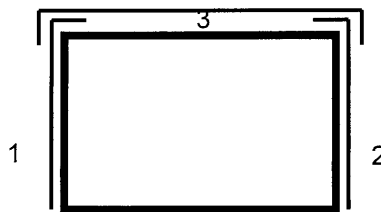


Figure 1

Cover the external joint sealer with a 3 foot (900 mm) strip of filter fabric conforming to Type 4 requirements in Section 1056 of the Standard Specifications.

Place multiple lines of a precast reinforced concrete box culvert such that the longitudinal joint between the sections has a minimum width of 3 inches (75 mm). Fill the joint between multiple lines of precast box sections with Class A concrete. Use Class A concrete that meets the requirements listed in the Standard Specifications except that Field Compressive Strength Specimens are not required.

#### D. Manufacture

Precast box culverts may be manufactured by either the wet cast method or dry cast method.

1. Mixture – In addition to the requirements of Section 1077 of the Standard Specifications, do not proportion the mix with less than 564 lb/yd<sup>3</sup> (335 kg/m<sup>3</sup>) of portland cement.
2. Strength – Make sure that all concrete develops a minimum 28-day compressive strength of 5000 psi (34.5 MPa). Movement of the precast sections should be minimized during the initial curing period. Any damage caused by moving or handling during the initial curing phase will be grounds for rejection of that precast section.
3. Air Entrainment – Air entrain the concrete in accordance with Section 1077 - 5(A) of the Standard Specifications. For dry cast manufacturing, air entrainment is not required.
4. Testing – Test the concrete in accordance with the requirements of Section 1077 - 5(B).
5. Handling – Handling devices or holes are permitted in each box section for the purpose of handling and laying. Submit details of handling devices or holes for approval and do not cast any concrete until approval is granted. Remove all handling devices flush with concrete surfaces as directed. Fill holes in a neat and workmanlike manner with an approved non-metallic non-shrink grout, concrete, or hole plug.

#### E. Physical Requirements

Acceptability of precast culvert sections is based on concrete cylinders made and tested in accordance with AASHTO T22 and AASHTO T23.

#### F. Permissible Variations

1. Flatness – All external surfaces shall be flat, true, and plumb. Irregularities, depressions, or high spots on all external surfaces shall not exceed 1/2 inch (12 mm) in 8 feet (2.5 meters).

2. Internal Dimensions – Produce sections so that the internal and haunch dimensions do not vary more than 1/4 inch (6 mm) from the plan dimensions.
3. Adjacent Sections - Internal, external, and haunch dimensions for connecting sections shall not vary more than 1/2 inch (12 mm).
4. Length of Tongue and Groove – The minimum length of the tongue shall be 4 inches (100 mm). The minimum length of the groove shall be 4 inches (100 mm). The dimensions of the tongue and groove shall not vary more than 1/4 inch (6 mm) from the plan dimensions.
5. Slab and Wall Thickness – Produce sections so that the slab and wall thickness are not less than that shown on the plans by more than 5% or 3/16 inch (5 mm), whichever is greater. A thickness more than that required on the plans is not a cause for rejection.
6. Length of Opposite Surfaces – Produce sections so that variations in laying lengths of two opposite surfaces of the box section meet the requirements of AASHTO M259, Section 11.3.
7. Length of Section – Produce sections so that the underrun in length of a section is not more than 1/2 inch (13 mm) in any box section.
8. Position of Reinforcement – Produce sections so that the maximum variation in the position of the reinforcement is  $\pm 3/8$ " ( $\pm 10$  mm) for slab and wall thicknesses of 5 inches (125 mm) or less and  $\pm 1/2$ " ( $\pm 13$  mm) for slab and wall thicknesses greater than 5 inches (125 mm). Produce sections so that the concrete cover is never less than 5/8 inch (16 mm) as measured to the internal surface or the external surface. The preceding minimum cover limitations do not apply at the mating surfaces of the joint.
9. Area of Reinforcement – Use the design steel shown on the plans for the steel reinforcement. Steel areas greater than those required are not cause for rejection. The permissible variation in diameter of any wire in finished fabric is prescribed for the wire before fabrication by either AASHTO M32 or M225.

#### G. Marking

1. Each section shall be match-marked in order of intended installation as indicated on the approved shop drawings. Ensure that pieces fit together neatly and in a workmanlike manner. In order to ensure a good, neat field fit, assemble adjacent sections at the producer's facility and match-mark the pieces. This will require that a minimum of three adjacent sections of the culvert be fitted at the production yard at a time and then match-marked. Once three sections have been match-marked, the first section may be removed for shipment and a fourth section set for marking. Continue in a progressive manner until all sections have been properly match-marked.



2. Clearly mark each section of the box culvert in accordance with AASHTO M259, Section 15.

#### H. Construction

1. Foundation – Foundation for precast box culvert shall meet the requirements of Section 414 of the Standard Specifications. In addition, Type VI foundation material shall be encapsulated in filter fabric conforming to Type 4 requirements in Section 1056 of the Standard Specifications. The filter fabric shall be placed perpendicular to the culvert barrel. Provide sufficient overhang beyond the excavation to allow a minimum lap of 3 feet (900 mm) when the foundation material is placed and fabric wrapped on top. Perpendicular sections of fabric shall be continuous. A minimum lap of 2 feet (600 mm) shall be provided between sections of fabric.
2. Installation – Sections shall be placed at the beginning of the outlet end of the culvert with the groove end being laid upgrade. Tongue sections shall be laid into the groove sections. Positive means shall be provided to pull each section firmly into the previously placed section so that the joints are tightly homed. Use a "come-along", box pullers or other approved methods to create a positive means of joining box sections. Construction equipment shall not have direct contact with the box section. The load of the box shall be suspended by lifting device during joining procedure.
3. Backfill – Complete backfill in accordance with Section 414 of the Standard Specifications.

### 3.0 BASIS OF PAYMENT

The Precast Reinforced Concrete Box Culvert as described on the plans and in this Special Provision will be paid for at the contract lump sum price for "Precast Reinforced Concrete Box Culvert at Station \_\_\_\_\_". Such price and payment will be full compensation for all work covered by this Special Provision, the plans and applicable parts of the Standard Specifications and will include, but not be limited to, furnishing all labor, materials (including all filter fabric), equipment and other incidentals necessary to complete this work. Such price and payment will also be full compensation for concrete, reinforcing steel, labor, equipment and all other related materials necessary for the completion of the barrel section, and the construction of the headwalls, end curtain walls, wings and wing footings. Culvert Excavation and Foundation Conditioning Material will be paid for in accordance with the Standard Specifications and will not be a part of this pay item.

Payment will be made under:

Precast Reinforced Concrete Box Culvert at Station \_\_\_\_\_ Lump Sum

**FALSEWORK AND FORMWORK**

(10-12-01)

**1.0 DESCRIPTION**

Use this Special Provision as a guide to develop temporary works submittals required by the Standard Specifications or other provisions; no additional submittals are required herein. Such temporary works include, but are not limited to, falsework and formwork.

Falsework is any temporary construction used to support the permanent structure until it becomes self-supporting. Formwork is the temporary structure or mold used to retain plastic or fluid concrete in its designated shape until it hardens. Access scaffolding is a temporary structure that functions as a work platform that supports construction personnel, materials, and tools, but is not intended to support the structure. Scaffolding systems that are used to temporarily support permanent structures (as opposed to functioning as work platforms) are considered to be falsework under the definitions given. Shoring is a component of falsework such as horizontal, vertical, or inclined support members. Where the term “temporary works” is used, it includes all of the temporary facilities used in bridge construction that do not become part of the permanent structure.

Design and construct safe and adequate temporary works that will support all loads imposed and provide the necessary rigidity to achieve the lines and grades shown on the plans in the final structure.

**2.0 MATERIALS**

Select materials suitable for temporary works; however, select materials that also ensure the safety and quality required by the design assumptions. The Engineer has authority to reject material on the basis of its condition, inappropriate use, safety, or nonconformance with the plans. Clearly identify allowable loads or stresses for all materials or manufactured devices on the plans. Revise the plan and notify the Engineer if any change to materials or material strengths is required.

**3.0 DESIGN REQUIREMENTS****A. Working Drawings**

Provide working drawings for items as specified in the contract, or as required by the Engineer, with design calculations and supporting data in sufficient detail to permit a structural and safety review of the proposed design of the temporary work.

When concrete placement is involved, include data such as the drawings of proposed sequence, rate of placement, direction of placement, and location of all construction joints. Submit the number of copies as called for by the contract.

When required, have the drawings and calculations prepared under the guidance of, and sealed by, a North Carolina Registered Professional Engineer who is knowledgeable in temporary works design.

Design falsework and formwork requiring submittals in accordance with the 1995 AASHTO *Guide Design Specifications for Bridge Temporary Works* except as noted herein.

### 1. Wind Loads

Table 2.2 of Article 2.2.5.1 is modified to include wind velocities up to 110 mph (177 km/hr). In addition, Table 2.2A is included to provide the maximum wind speeds by county in North Carolina.

**Table 2.2 - Wind Pressure Values**

Height Zone feet (m) above ground	Pressure, lb/ft <sup>2</sup> (kPa) for Indicated Wind Velocity, mph (km/hr)				
	70 (112.7)	80 (128.7)	90 (144.8)	100 (160.9)	110 (177.0)
0 to 30 (0 to 9.1)	15 (0.72)	20 (0.96)	25 (1.20)	30 (1.44)	35 (1.68)
30 to 50 (9.1 to 15.2)	20 (0.96)	25 (1.20)	30 (1.44)	35 (1.68)	40 (1.92)
50 to 100 (15.2 to 30.5)	25 (1.20)	30 (1.44)	35 (1.68)	40 (1.92)	45 (2.15)
over 100 (30.5)	30 (1.44)	35 (1.68)	40 (1.92)	45 (2.15)	50 (2.39)

### 2. Time of Removal

The following requirements replace those of Article 3.4.8.2.

Do not remove forms until the concrete has attained strengths required in Article 420-17 of the Standard Specifications and these Special Provisions.

Do not remove forms until the concrete has sufficient strength to prevent damage to the surface.

**Table 2.2A - Steady State Maximum Wind Speeds by Counties in North Carolina**

COUNTY	25 YR (mph) (km/hr)	COUNTY	25 YR (mph) (km/hr)	COUNTY	25 YR (mph) (km/hr)
Alamance	70 (112.7)	Franklin	70 (112.7)	Pamlico	100 (160.9)
Alexander	70 (112.7)	Gaston	70 (112.7)	Pasquotank	100 (160.9)
Alleghany	70 (112.7)	Gates	90 (144.8)	Pender	100 (160.9)
Anson	70 (112.7)	Graham	80 (128.7)	Perquimans	100 (160.9)
Ashe	70 (112.7)	Granville	70 (112.7)	Person	70 (112.7)
Avery	70 (112.7)	Greene	80 (128.7)	Pitt	90 (144.8)
Beaufort	100 (160.9)	Guilford	70 (112.7)	Polk	80 (128.7)
Bertie	90 (144.8)	Halifax	80 (128.7)	Randolph	70 (112.7)
Bladen	90 (144.8)	Harnett	70 (112.7)	Richmond	70 (112.7)
Brunswick	100 (160.9)	Haywood	80 (128.7)	Robeson	80 (128.7)
Buncombe	80 (128.7)	Henderson	80 (128.7)	Rockingham	70 (112.7)
Burke	70 (112.7)	Hertford	90 (144.8)	Rowan	70 (112.7)
Cabarrus	70 (112.7)	Hoke	70 (112.7)	Rutherford	70 (112.7)
Caldwell	70 (112.7)	Hyde	110 (177.0)	Sampson	90 (144.8)
Camden	100 (160.9)	Iredell	70 (112.7)	Scotland	70 (112.7)
Carteret	110 (177.0)	Jackson	80 (128.7)	Stanley	70 (112.7)
Caswell	70 (112.7)	Johnston	80 (128.7)	Stokes	70 (112.7)
Catawba	70 (112.7)	Jones	100 (160.9)	Surry	70 (112.7)
Cherokee	80 (128.7)	Lee	70 (112.7)	Swain	80 (128.7)
Chatham	70 (112.7)	Lenoir	90 (144.8)	Transylvania	80 (128.7)
Chowan	90 (144.8)	Lincoln	70 (112.7)	Tyrell	100 (160.9)
Clay	80 (128.7)	Macon	80 (128.7)	Union	70 (112.7)
Cleveland	70 (112.7)	Madison	80 (128.7)	Vance	70 (112.7)
Columbus	90 (144.8)	Martin	90 (144.8)	Wake	70 (112.7)
Craven	100 (160.9)	McDowell	70 (112.7)	Warren	70 (112.7)
Cumberland	80 (128.7)	Mecklenburg	70 (112.7)	Washington	100 (160.9)
Currituck	100 (160.9)	Mitchell	70 (112.7)	Watauga	70 (112.7)
Dare	110 (177.0)	Montgomery	70(112.7)	Wayne	80 (128.7)
Davidson	70 (112.7)	Moore	70 (112.7)	Wilkes	70 (112.7)
Davie	70 (112.7)	Nash	80 (128.7)	Wilson	80 (128.7)
Duplin	90 (144.8)	New Hanover	100 (160.9)	Yadkin	70 (112.7)
Durham	70 (112.7)	Northampton	80 (128.7)	Yancey	70 (112.7)
Edgecombe	80 (128.7)	Onslow	100 (160.9)		
Forsyth	70 (112.7)	Orange	70 (112.7)		

Note on the working drawings any anchorages, connectors, inserts, steel sleeves or other such devices used as part of the falsework or formwork that remains in the permanent structure. If the plan notes indicate that the structure contains the necessary corrosion protection required for a Corrosive Site, epoxy coat, galvanize, metallize or otherwise protect these devices as directed by the Engineer. Any coating required by the Engineer will be considered incidental to the various pay items requiring temporary works.

#### B. Review and Approval

The Engineer is responsible for the review and approval of temporary works' drawings.

Submit the working drawings sufficiently in advance of proposed use to allow for their review, revision (if needed), and approval without delay to the work.

Do not start construction of any temporary work for which working drawings are required until the drawings have been approved. Such approval does not relieve the Contractor of the responsibility for the accuracy and adequacy of the working drawings.

The time period for review of the working drawings does not begin until complete drawings and design calculations, when required, are received by the Engineer.

On the drawings, show all information necessary to allow the design of any component to be checked independently as determined by the Engineer.

If requested by the Engineer, submit with the working drawings manufacturer's catalog data listing the weight of all construction equipment that will be supported on the temporary work. Show anticipated total settlements and/or deflections of falsework and forms on the working drawings. Include falsework footing settlements, joint take-up, and deflection of beams or girders. Design the falsework and forms supporting deck slabs and overhangs on girder bridges so that there will be no differential settlement between the girders and the deck forms during placement of deck concrete.

#### 4.0 CONSTRUCTION REQUIREMENTS

All requirements of Section 420 of the Standard Specifications apply.

Construct temporary works in conformance with the approved working drawings. Ensure that the quality of materials and workmanship employed is consistent with that assumed in the design of the temporary works. Do not weld falsework members to any portion of the permanent structure unless approved. Show any welding to the permanent structure on the approved construction drawings.

Provide tell-tales attached to the forms and extending to the ground, or other means, for accurate measurement of falsework settlement. Make sure that the anticipated compressive settlement and/or deflection of falsework does not exceed 1 inch (25 mm). For cast-in-place concrete structures, make sure that the calculated deflection of falsework

flexural members does not exceed  $1/240$  of their span regardless of whether or not the deflection is compensated by camber strips.

#### A. Maintenance and Inspection

Inspect and maintain the temporary work in an acceptable condition throughout the period of its use. Certify that the manufactured devices have been maintained in a condition to allow them to safely carry their rated loads. Clearly mark each piece so that its capacity can be readily determined at the job site.

Perform an in-depth inspection of an applicable portion(s) of the temporary works, in the presence of the Engineer, not more than 24 hours prior to the beginning of each concrete placement. Inspect other temporary works at least once a month to ensure that they are functioning properly. Have a North Carolina Registered Professional Engineer inspect the cofferdams, shoring, sheathing, support of excavation structures, and support systems for load tests prior to loading.

#### B. Foundations

Determine the safe bearing capacity of the foundation material on which the supports for temporary works rest. If required by the Engineer, conduct load tests to verify proposed bearing capacity values that are marginal or in other high-risk situations.

The use of the foundation support values shown on the contract plans of the permanent structure is permitted if the foundations are on the same level and on the same soil as those of the permanent structure.

Allow for adequate site drainage or soil protection to prevent soil saturation and washout of the soil supporting the temporary works supports.

If piles are used, the estimation of capacities and later confirmation during construction using standard procedures based on the driving characteristics of the pile is permitted. If preferred, use load tests to confirm the estimated capacities; or, if required by the Engineer conduct load tests to verify bearing capacity values that are marginal or in other high risk situations.

The Engineer reviews and approves the proposed pile and soil bearing capacities.

### 5.0 REMOVAL

Unless otherwise permitted, remove and keep all temporary works upon completion of the work. Do not disturb or otherwise damage the finished work.

Remove temporary works in conformance with the contract documents. Remove them in such a manner as to permit the structure to uniformly and gradually take the stresses due to its own weight.

**6.0 METHOD OF MEASUREMENT**

Unless otherwise specified, temporary works will not be directly measured.

**7.0 BASIS OF PAYMENT**

Payment at the contract unit prices for the various pay items requiring temporary works will be full compensation for the above falsework and formwork.

**SUBMITTAL OF WORKING DRAWINGS**

**(8-13-04)**

**1.0 GENERAL**

Submit working drawings in accordance with Article 105-2 of the Standard Specifications and the requirements of this Special Provision. The list of submittals contained herein does not represent a list of required submittals for this project. Submittals are only necessary for those items as required by the Standard Specifications, other Special Provisions, or contract plans. Make submittals that are not specifically noted in this Special Provision directly to the Resident Engineer.

If submittals contain variations from plan details or specifications, significantly affect project cost, or significantly affect field construction or operations, discuss them with, and submit them through, the Resident Engineer. State the reason for the proposed variation in the submittals. To minimize overall review time, make sure all working drawing submittals are complete when first submitted. Provide a contact name and phone number with each submittal. Direct any questions regarding working drawing submittal requirements to the Resident Engineer, Structure Design Unit contacts or the Geotechnical Engineering Unit contacts noted below.

**2.0 WORKING DRAWINGS SUBMITTAL CONTACTS**

All submittals noted herein are reviewed by the Structure Design Unit and/or the Geotechnical Engineering Unit.

For submittals to the Structure Design Unit, use the following addresses:

Via US mail:

Mr. G. R. Perfetti, P. E.  
State Bridge Design Engineer  
North Carolina Department  
of Transportation  
Structure Design Unit  
1581 Mail Service Center  
Raleigh, NC 27699-1581

Attention: Mr. P. D. Lambert, P. E.

Via other delivery service:

Mr. G. R. Perfetti, P. E.  
State Bridge Design Engineer  
North Carolina Department  
of Transportation  
Structure Design Unit  
1000 Birch Ridge Drive  
Raleigh, NC 27610

Attention: Mr. P. D. Lambert, P. E.

For submittals to the Geotechnical Engineering Unit, use the following addresses:

For projects in Divisions 1-7, use the following Eastern Regional Office address:

Via US mail:

Mr. K. J. Kim, Ph. D., P. E.  
Eastern Regional Geotechnical  
Manager  
North Carolina Department  
of Transportation  
Geotechnical Engineering Unit  
Eastern Regional Office  
1570 Mail Service Center  
Raleigh, NC 27699-1570

Via other delivery service:

Mr. K. J. Kim, Ph. D., P. E.  
Eastern Regional Geotechnical  
Manager  
North Carolina Department  
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Geotechnical Engineering Unit  
Eastern Regional Office  
3301 Jones Sausage Road, Suite 100  
Garner, NC 27529

For projects in Divisions 8-14, use the following Western Regional Office address:

Via US mail:

Mr. John Pilipchuk, L. G., P. E.  
Western Regional Geotechnical  
Manager  
North Carolina Department  
of Transportation  
Geotechnical Engineering Unit  
Western Regional Office  
5253 Z Max Boulevard  
Harrisburg, NC 28075

Via other delivery service:

Mr. John Pilipchuk, L. G., P. E.  
Western Region Geotechnical  
Manager  
North Carolina Department  
of Transportation  
Geotechnical Engineering Unit  
Western Regional Office  
5253 Z Max Boulevard  
Harrisburg, NC 28075

Direct any questions concerning submittal review status, review comments, or drawing markups to the following contacts:

Primary Structures Contact:

Paul Lambert  
(919) 250 – 4041  
(919) 250 – 4082 facsimile  
[plambert@dot.state.nc.us](mailto:plambert@dot.state.nc.us)

Secondary Structures Contacts:

James Gaither (919) 250 – 4042  
Man-Pan Hui (919) 250 – 4044

Eastern Regional Geotechnical Contact (Divisions 1-7):

K. J. Kim  
(919) 662 – 4710  
(919) 662 – 3095 facsimile  
[kkim@dot.state.nc.us](mailto:kkim@dot.state.nc.us)



Western Regional Geotechnical Contact (Divisions 8-14):

John Pilipchuk  
(704) 455 – 8902  
(704) 455 – 8912 facsimile  
[jpilipchuk@dot.state.nc.us](mailto:jpilipchuk@dot.state.nc.us)

**3.0 SUBMITTAL COPIES**

The quantities provided in this Special Provision act as a guide in the submittal process.

Unless otherwise required by the contract, submit two sets of supporting calculations to the Structure Design Unit.

Furnish one complete copy of the submittal, including all attachments, to the Resident Engineer. If requested, provide additional copies of any submittal. At the same time, submit the following number of copies directly to the Structure Design Unit and/or the Geotechnical Engineering Unit:

<b>Working Drawing Submittal</b>	<b>Copies Required by Structure Design Unit</b>	<b>Copies Required by Geotechnical Engineering Unit</b>	<b>Contract Reference Requiring Submittal <sup>1</sup></b>
Arch Culvert Falsework	5	0	Plan Note & SN Sheet
Box Culvert Falsework <sup>2</sup>	5	0	Plan Note & SN Sheet
Cofferdams <sup>4</sup>	6	1	Articles 410-5 and 420-8
Expansion Joint Seals (hold down plate type with base angle)	9	0	“Expansion Joint Seals”
Expansion Joint Seals (modular)	2, then 9	0	“Modular Expansion Joint Seals”
Expansion Joint Seals (strip seals)	9	0	“Strip Seals”
Falsework & Forms (superstructure)	8	0	Article 420-3
Falsework & Forms <sup>2</sup> (substructure)	8	0	Article 420-3
Mechanically Stabilized Earth Retaining Walls <sup>4</sup>	7	1	“MSE Retaining Walls”
Metal Bridge Railing	8	0	Plan Note
Metal Stay-in-Place Forms	8	0	Article 420-3
Metalwork for Elastomeric Bearings <sup>5,6</sup>	7	0	Article 1072-10
Miscellaneous Metalwork <sup>5,6</sup>	7	0	Article 1072-10
Overhead Sign Assemblies	13	0	Article 903-3(C)
Pile Points	7	1	Article 450-8(D) & “Steel Pile Points”
Placement of Equipment on Structures (cranes, etc.)	7	0	Article 420-20

Precast Concrete Box Culverts	2, then 1 reproducible	0	“(Optional) Precast Reinforced Concrete Box Culvert at Station ____”
Precast Retaining Wall Panels	10	0	Article 1077-2
Pot bearings <sup>5</sup>	8	0	“Pot Bearings”
Prestressed Concrete Deck Panels	6 and 1 reproducible	0	Article 420-3
Proprietary retaining walls <sup>4</sup>	9	1	Applicable Project Special Provision
Prestressed Concrete Girder (strand elongation and detensioning sequences)	6	0	Articles 1078-8 and 1078-11
Prestressed Concrete Cored Slab (detensioning sequences) <sup>3</sup>	6	0	Article 1078-11
Revised Bridge Deck Plans (adaptation to metal stay-in-place forms)	2, then 1 reproducible	0	Article 420-3
Revised Bridge Deck Plans (adaptation to modular expansion joint seals)	2, then 1 reproducible	0	“Modular Expansion Joint Seals”
Soil Nail Retaining Walls <sup>4</sup>	4	1	Applicable Project Special Provision
Sound Barrier Wall Steel Fabrication Plans <sup>6</sup>	7	0	Article 1072-10 & “Sound Barrier Wall”
Sound Barrier Wall Casting Plans	10	0	Article 1077-2 & “Sound Barrier Wall”
Structural Steel <sup>5</sup>	2, then 7	0	Article 1072-10
TFE Expansion Bearings <sup>5</sup>	8	0	Article 1072-10
Temporary Detour Structures <sup>4</sup>	10	1	Article 400-3 & “Construction, Maintenance and Removal of Temporary Structure at Station ____”
Temporary Shoring <sup>4</sup>	6	1	Article 410-4 & “Temporary Shoring for Maintenance of Traffic”

Temporary Fabric or Wire Walls <sup>8</sup>	0	2	Applicable Project Special Provision
Permanent Anchored Tieback Retaining Walls <sup>4</sup>	4	1	Applicable Project Special Provision
Evazote Joint Seals <sup>7</sup>	9	0	Applicable Project Special Provision
Optional Disc Bearings <sup>5</sup>	8	0	“Optional Disc Bearings”
Removal of Existing Structure over Railroad	5	0	Railroad Special Provisions
Drilled Pier Construction Sequence Plans <sup>8</sup>	0	2	“Drilled Piers”
Pile Hammers <sup>8</sup>	0	2	Article 450-6

#### FOOTNOTES

1. References are provided to help locate the part of the contract where the working drawing submittals are required. References in quotes refer to the Project Special Provision by that name. Articles refer to the Standard Specifications.
2. Submittals for these items are necessary only when plan notes require them.
3. Submittals for these items may not be required. A list of pre-approved sequences is available from the producer or the Materials and Tests Unit.
4. These submittals are reviewed by the Structure Design Unit and the Geotechnical Engineering Unit. If NCDOT Shoring Standards are used, working drawings need not be submitted, but the Shoring Selection Form should be forwarded to the Geotechnical Engineering Unit.
5. The fabricator may submit these items directly to the Structure Design Unit.
6. The two sets of preliminary submittals required by Article 1072-10 of the Standard Specifications are not required for these items.
7. Submittals for Fabrication Drawings are not required. Submission of Catalogue Cuts of Proposed Material is required. See Section 5.A of the Project Special Provision.
8. Submittals for these items are reviewed by the Geotechnical Engineering Unit only and correspondence regarding these items should be directed to and will come from the Geotechnical Engineering Unit.

**REMOVAL OF EXISTING STRUCTURE AT STATION 13+14.00 -L- (SPECIAL)**

The existing structure is to be removed in accordance with the Standard Specifications.

Upon removal, all I-beams and the timber deck shall become the property of the North Carolina Department of Transportation.

The Standard Specifications 402-2(b) first paragraph shall be revised as follows:

After all the timber deck and I-beams have been removed, the Contractor is to notify Terry L. Harris, phone number 704-982-3720 to manage pick-up by State forces. The Contractor is to load the I-beams and timber deck onto State trucks when they come for the pickup.

No separate measurement will be made for this work and the entire cost of this work shall be included in the lump sum price bid for "Removal of Existing Structure at Station \_\_\_\_\_".

Payment will be made under:

Removal of Existing Structure at Station \_\_\_\_\_.....Lump Sum

**CRANE SAFETY**

**11-09-04**

Submit all items listed below to the Engineer prior to beginning crane operations. . Changes in personnel or equipment must be reported to the Engineer and all applicable items listed below must be updated and submitted prior to continuing with crane operations.

Comply with the manufacturer specifications and limitations applicable to the operation of any and all cranes and derricks. Prime contractors, sub-contractors, and fully operated rental companies shall comply with the current Occupational Safety and Health Administration regulations (OSHA).

**CRANE SAFETY SUBMITTAL LIST**

- A. **Competent Person:** Provide the name and qualifications of the "Competent Person" responsible for crane safety and lifting operations. The named competent person will have the responsibility and authority to stop any work activity due to safety concerns.
- B. **Riggers:** Provide the qualifications, experience and training of the persons responsible for rigging operations. Training should include, but not be limited to, weight calculations, center of gravity determinations, sling selection and capacities, sling and rigging equipment inspection, safe rigging practices, and determining load weights.
- C. **Crane Inspections:** Inspection records for all cranes shall be current and readily accessible for review upon request.

- D. **Crane Operators:** By January 1, 2006, all crane operators shall be certified by NC CCO (National Commission for the Certification of Crane Operators), or satisfactorily complete the Carolinas AGC's Professional Crane Operator's Proficiency Program. Other approved nationally accredited programs will be considered upon request. Submit current certification for the type of crane operated (small hydraulic, large hydraulic, small lattice, large lattice) and medical evaluations, for each operator.

Medical evaluations shall meet or exceed the CCO medical evaluation requirements and must remain current within a 3-year expiration date. Utilize either the CCO Physical Examination Form or a current DOT Medical Examiner's Certificate.